REMARKS/ARGUMENTS

Favorable reconsideration of this application as presently amended in light of the following discussion is respectfully requested.

Claims 1-11 and 17-26 are now pending in this application. Claims 12-16 are herein canceled. Claims 1 and 2 are amended to correct clerical errors. Further, claims 1, 2, and 3 are amended, and claims 17-26 are added, to more clearly claim the present invention. No new matter is added.

In the outstanding Office Action, claims 12-16 were rejected under 35 U.S.C §102(b) as anticipated by Schmidt, U.S. Patent No. 6,072,076. The rejections of claims 12-16 are rendered moot by the cancellation of these claims.

Claims 1-11 were rejected under 35 U.S.C. § 103(a) as obvious over Briton, U.S. Patent No. 2,144,612 ("the Briton '612 patent"), in view of Briton, U.S. Patent No. 2,198,600 ("the Briton '600 patent"). These rejections are respectfully traversed, as the Office has failed to state a prima facie case of obviousness.

As amended, claim 1, from which claims 2-11 depend directly or indirectly, is directed to a method of preparing 1,3-dichloro-2-propanol and 2,3-dichloro-1-propanol. The method comprises hydrochlorinating glycerine with gaseous hydrogen chloride with the catalysis of a carboxylic acid. The liquid feed contains at least 50% by weight of glycerine. The hydrochlorination is carried out without a solvent, in at least one continuous reaction zone at reaction temperatures in the range of 70-140°C, and with the continuous removal of the water of reaction. The continuous removal of water is effected by distillation at reduced pressure.

The Briton '612 patent teaches the preparation of glycerol dichlorohydrin by reacting glycerol with hydrogen chloride in the presence of a carboxylic acid catalyst, at a temperature not appreciably in excess of 100°C. The '612 patent does not teach that the

hydrochlorination is carried out without a solvent. Instead, the central teaching of the'612 patent is that the hydrogen chloride is reacted with glycerol in the presence of an inert water-immiscible organic solvent in which the dichlorohydrin product is soluble. The main function of the solvent in the system taught by the '612 patent is to shift the vapor-liquid equilibrium, as the mixture is an azeotropic mixture, as evidenced by **Attachment 1** (LANGE'S HANDBOOK OF CHEMISTRY, 14th Ed. 1992), which confirms that the solvents in the '612 patent are those that form binary azeotropic mixtures with water. Azeotropic distillation techniques, as described in **Attachment 2** (PERRY'S CHEMICAL ENGINEER'S HANDBOOK, 6th Ed., 1984), allow for the effective removal of the reaction water from the reaction liquid phase at lower temperatures. It is clear from the '612 patent that the solvent is required to allow for the effective removal of excess water in the '612 system.

Moreover, claim 1 of the present application requires that the hydrochlorination is carried out in at least one continuous reaction zone at reaction temperatures in the range of 70-140°C, and with the continuous removal of the water of reaction effected by distillation at reduced pressure. The '612 patent does not teach hydrochlorination in at least one continuous reaction zone, with the continuous removal of the water of reaction by distillation at reduced pressure. The removal of water of reaction taught by the '612 patent is based on use of the disclosed solvent.

The Briton '600 patent teaches the use of organic solvents in the purification of glycerol dichlorohydrin. The water formed in the reactor in the '600 patent is removed in a batch process without use of a solvent. Such a system had inferior results because the composition in the reactor changes over time. For example, in Example 1 of the '600 patent, there was only a 72.5% overall yield of dichlorohytrin, even with a high concentration (4.6%) of catalyst. This compares poorly to the present invention, with a yield of 95.6% with a

catalyst concentration of only 2%. Only the use of a functional solvent, such as that in the '612 patent, could improve the results of the '600 method.

In any event, like the '612 patent, the '600 patent fails to teach or suggest a process of hydrochlorination in at least one continuous reaction zone, with the continuous removal of the water of reaction by distillation at reduced pressure. Accordingly, the '600 patent does not remedy the inadequacies of the '612 patent.

To establish a prima facie case of obviousness, all of the claim features must be taught or suggested by the cited prior art. *In re Royka,* 490 F.2d 981, 180 USPQ 580 (CCPA 1974). Moreover, all words in a claim must be considered in judging the patentability of that claim against the prior art. *In re Wilson*, 424 F.2d 1382, 1385, 165 USPQ 494, 496 (CCPA 1970). As noted above, the cited references do not teach or suggest a method of preparing 1,3-dichloro-2-propanol and 2,3-dichloro-1-propanol comprising hydrochlorinating glycerine and/or monochloropropanediols with gaseous hydrogen chloride, in which the hydrochlorination is carried out without a solvent, in at least one continuous reaction zone at reaction temperatures in the range of 70-140°C, and with the continuous removal of the water of reaction by distillation at reduced pressure. Failing to do so, these references cannot render claim 1, or the claims depending therefrom, obvious. Accordingly, Applicants respectfully request withdrawal of the rejections of claims 1-11.

Far from being obvious, the present invention is a completely new approach to the production of dichloropropanol, not based on any combination of the '600 and '612 patents. We note the following comparisons between example 1 in the '600 patent and the present invention:

	Example 1 of U.S. '600	Example 1 of present application
Process type	Batch	Continuous
Solvent in reaction	No	No
Solvent in purification	Yes	No
Vacuum distillation	No	Yes
Overall Yield of DCP based on glycerol provided	72.5%	95.6%
Catalyst concentration	4.6%	2.05%

Similarly, we note the following comparisons between example 3 in the '612 patent and the present invention:

	Example 3 of U.S. '612	Example 1 of present application
Process type	Batch	Continuous
Solvent in reaction	Yes	No
Solvent in purification	No	No
Vacuum distillation	No	Yes
Overall Yield of DCP based on glycerol provided	91.0%	95.6%
Catalyst concentration	5.2%	2.05%

These comparisons clearly show the superiority of the present method as compared to the processes in the cited references. The combination of a reaction zone with a distillation zone with reduced pressure allows for the effective removal of the reaction water in the present method, resulting in better yields of dichloropropanol due to shifting the chemical equilibrium toward this product.

The '600 and '612 patents both teach the use of an organic solvent. A person skilled in the art would not be led by these references to develop a process using no solvent, as the

'612 patent teaches that water of reaction cannot be conveniently removed without such a solvent. '612 patent, page 1, lines 26-30. The present invention resolves the need for such solvents, with its separate reaction zone and vacuum distillation zones. These allow for the optimization of conditions in both zones, and result in the efficient continuous manner of operation. Such a system is not disclosed in the prior art.

In light of the above discussion, the present application is believed to be in condition for allowance. An early and favorable action to that effect is respectfully requested.

Respectfully submitted,

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